EVALUATION OF SELECTED SHIPPING CONTAINERS FOR EASTERN-GROWN PEACHES

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CONTENTS

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SUMMARY

The crown-cover basket—in 1-, ¾-, and ½-bushel capacities—has been the shipping container commonly used by the peach industry in the Eastern United States for the past 50 years. The bushel basket, which was generally used for many years, has been largely replaced by the ¾- and ½-bushel baskets.

Five new shipping containers designed to hold 38 pounds of peaches and the conventional crown-cover basket were studied during the 1962 and 1963 peach seasons. The new containers studied were (1) part-telescope veneer-fiberboard box, (2) full-telescope fiberboard box, (3) part-telescope H-divider fiberboard box, (4) part-telescope wing-lock fiberboard box, and (5) flat-top basket.

The crown-cover and flat-top baskets, with accessory materials, cost 56.9 and 54.5 cents, respectively. The H-divider box cost 35.5 cents each; the full-telescope box cost 39.3 cents; the wing-lock box cost 47.0 cents; and the veneer-fiberboard box cost 48.2 cents. Because the boxes are jumble-packed and not faced, the packing labor cost is 3.5 cents a container less than for the baskets.

An average of 9.1 percent of the peaches shipped in the crown-cover basket were bruised on arrival in terminal markets. Between 3.7 and 5.9 percent were bruised when shipped in the boxes and the flat-top baskets.

Eastern peach growers who adopt the cheaper boxes and jumble-pack them can expect to save 12 to 25 cents a unit. If all eastern-grown peaches were jumble-packed and shipped in the new containers, savings would amount to several million dollars annually.

EVALUATION OF SELECTED SHIPPING CONTAINERS FOR EASTERN-GROWN PEACHES

By Philip W. Hale, agricultural economist, and Earl D. Mallison, agricultural marketing specialist, Transportation and Facilities Research Division, Agricultural Research Service

INTRODUCTION

An acceptable shipping container for peaches should protect the peaches throughout the entire marketing system. It should be inexpensive and easy to assemble and pack and to load into trucks or rail cars; it should retain its appearance and original stacking strength for 3 to 8 days. Most shippers prefer a container that can be assembled without the use of specialized equipment.

A new flat-top basket and four types of jumble-filled boxes for fresh peaches were evaluated in June and July 1962 in Georgia and South Carolina, in August 1962 in New Jersey, and again in June, July, and August 1963 in Georgia and South Carolina. The new containers were compared with each other and with the crown-cover basket in terms of their cost, the labor cost to pack them, and other features.

The cost of containers was obtained from peach shippers. Time studies were made in peach packing plants to determine labor requirements and costs.

Test shipments were made to terminal markets in Michigan, Ohio, Pennsylvania, New York, and New England. All test shipments of the boxes contained each of the four types. The test shipments of baskets included both the flat-top and the crown-cover baskets. The commercial load of boxes and baskets, including the test packages, totaled about 600 containers.

The peaches were inspected in the terminal markets to determine the amount and severity of bruising. The condition of the containers and the ease of handling and stacking them were observed.

Tests were made to determine the effect of slack and overfull packs on the incidence of bruising during transit.

The objective of the study was to decrease the cost of marketing fresh peaches through lower container and packing costs and to reduce peach bruising in transport and handling.

DESCRIPTION OF CONTAINERS

BASKETS

The conventional crown-cover and flat-top baskets are round with wood-veneer stave sides. The bottoms are constructed of solid board. The crown cover is held in place by a handle slat, two wire handles, and two loop fasteners (fig. 1).

The side staves of the flat-top basket extend seven-eighths of an inch above the top inside hoop. The flat rimless cover of the new basket is held in place by four wire loop fasteners (fig. 1). A cushion pad is placed under the cover of each basket.

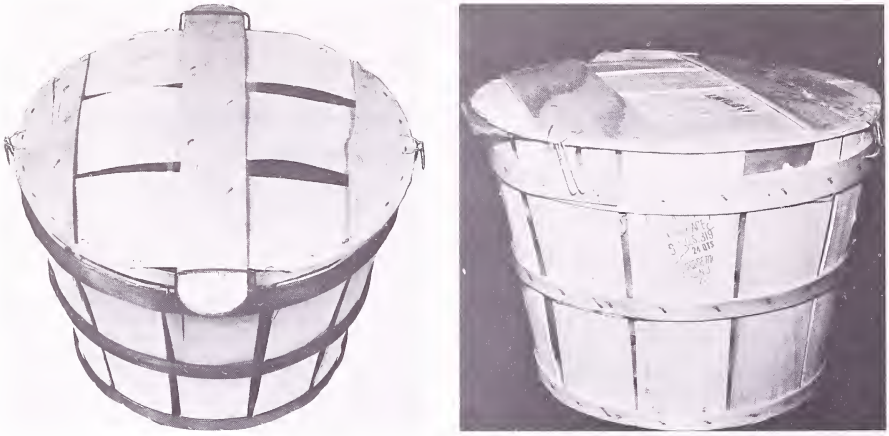
The capacity of the ¾-bushel baskets is defined by the U.S. Standard Container Act as 1,612.8 cubic inches. The tare weight of these baskets varied between 4.5 and 5 pounds (table 1).

The crown-cover basket holds a minimum net

TABLE 1.—*Tare weight and capacity of containers evaluated in plants in Georgia, South Carolina, and New Jersey, 1962–63* [1]

Type of container	Tare weight	Capacity
	Pounds	*Cubic inches*
Baskets:		
Crown-cover	4.5–5	1,612.8
New flat-top	4.5–5	1,612.8
Boxes:		
Part-telescope veneer-fiberboard	3.5	2,011
Full-telescope fiberboard	2.75	1,981
Part-telescope H-divider fiberboard	2.75	2,063
Part-telescope wing-lock fiberboard	3.5	2,018

[1] Tare weights and inside dimensions were obtained by weighing and measuring a number of empty containers in peach packing plants.



(Left) 17863 (Right) BN–21717

FIGURE 1.—Baskets with paper liner, cushion, and cover. (Left) Crown-cover basket; (right) new flat-cover basket.

weight of 38 pounds of peaches. This is considered the standard weight for the ¾-bushel container.

BOXES

Each of the four boxes studied was designed to hold a minimum net weight of 38 pounds of peaches when jumble-packed. The capacity of these containers varied from 1,981 to 2,063 cubic inches, and the tare weights ranged from 2.75 to 3.5 pounds (table 1). Pads were not used in the boxes.

The sides and bottom of the veneer-fiberboard box with part-telescope cover are made of veneer slats connected at the ends to two wood frames; each frame has a moisture-resistant fiberboard panel (fig. 2). The inner sidewalls and bottom are lined with a water-resistant chipboard. This part of the box is bound together with wire. The part-telescope cover is made of water-resistant, double-faced corrugated board. This container is assembled manually.

The full-telescope box has a 350-pound test double-wall fiberboard bottom and a 200-pound test single-wall fiberboard top (fig. 3). A stapling machine is used to assemble the top and bottom halves.

The H-divider box with part-telescope cover is constructed of single-wall, 250-pound test, corrugated fiberboard (fig. 4). An H-type insert divides the container crosswise into two equal compartments. The box is assembled manually by interlocking the top, bottom, and side flaps into position.

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FIGURE 2.—Veneer-fiberboard box, with water-resistant chipboard liner and a lid with 3-inch sides. Inside dimensions are 17 by 10⅞ by 10⅞ inches.

The wing-lock box is designed for hydrocooling after being packed with warm fruit (fig. 5). The bottom is constructed of 250-pound test, wax-impregnated fiberboard, and the part-telescope lid is of 200-pound test, corrugated fiberboard. The box is manually assembled.

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FIGURE 3.—Two-piece full-telescope ventilated fiberboard box. Inside dimensions are 16¾ by 11 by 10¾ inches.

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FIGURE 4.—Part-telescope, ventilated, H-divider fiberboard box. Inside dimensions are 17⅝ by 11½ by 10¼ inches.

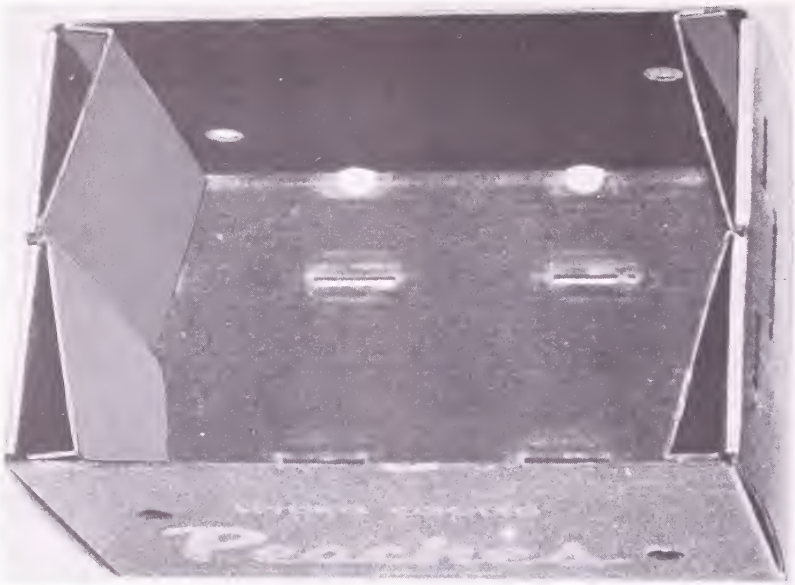

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FIGURE 5.—Ventilated, wax-impregnated fiberboard box with wing lock. The lid with 3-inch sides is not shown. Inside dimensions are 16½ by 11½ by 11½ inches.

USE OF CONTAINERS WITH HYDROCOOLERS

Eastern peaches are generally precooled either before or after they are packed by passing them through a cold water bath. The purpose of precooling is to reduce the pulp temperature to retard ripening and development of decay.

Peaches are precooled before packing in the shipping container by (1) passing the filled field boxes through a cold water shower, (2) floating the peaches through a tank filled with cold water, or (3) a combination of (1) and (2).

The most common practice, especially in the Southeastern States, is to pack the peaches in the container, which is then passed through a chamber where cold water passes over and through the container and over the surface of the peaches. The cover is then placed on the container.

Of the containers evaluated in this study, only the veneer baskets, the veneer-fiberboard box, and the wax-impregnated fiberboard box are moisture-resistant enough to withstand this second method of hydrocooling. Peaches packed in the nonmoisture-resistant fiberboard boxes were hydrocooled before being packed.

METHODS OF PACKING

BASKETS

The crown-cover and flat-top baskets are packed in the same way. After grading and sorting, the peaches move directly to facing stations. Selected peaches are arranged in round metal pans to form the face or top layer (fig. 6). Flat pans are used for the new baskets and concave pans for the conventional basket with the crown cover. A metal mold lined with a paper insert is then placed on the pan holding the "facers." The combination metal mold and face pans are then conveyed under chutes and jumble-filled with semiautomatic equipment or manually (figs. 7 and 8).

The metal mold is removed, the basket is placed over the filled liner, and a manual or automatic device turns the basket to an upright position. The round facing pan is then returned to the facing stations, and the filled basket moves to the hydrocooler.

After cooling, the face, or top layer of the pack, is inspected, and individual peaches that detract from the appearance of the pack are replaced. A protective pad and cover are then placed over the pack, and the cover is fastened in place. The baskets are labeled and stamped with grade, size, and variety of fruit packed, and loaded into refrigerated vehicles.

BOXES

The methods of packing and handling the four types of boxes in the packinghouses are basically the same. The boxes are not faced. They are jumble-packed by placing the empty containers directly under chutes operated semiautomatically (fig. 7) or manually (fig. 8).

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FIGURE 6.—Preparing the face, or top layer, of peaches in round metal pans.

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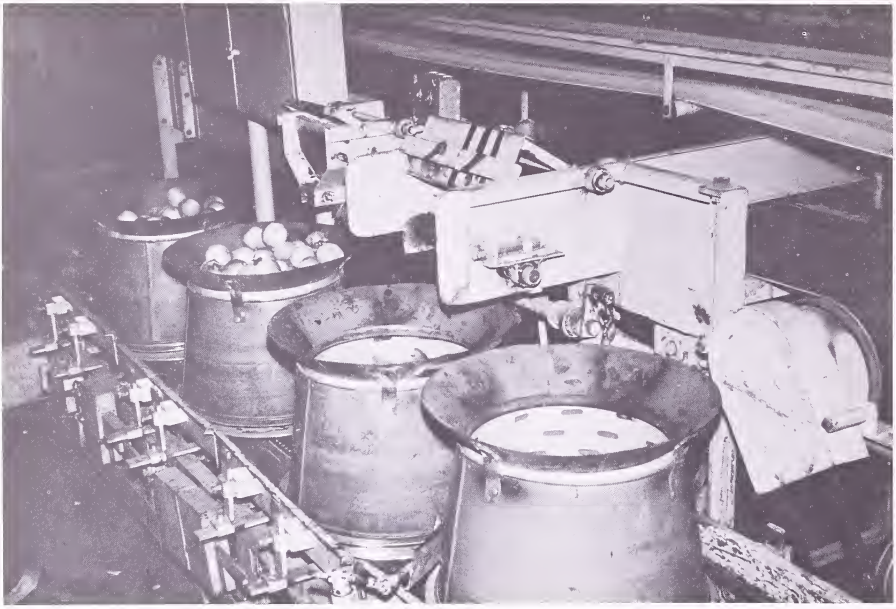

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FIGURE 7.—Semiautomatic filling chute for ¾-bushel baskets.

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FIGURE 8.—With container full and flow of peaches stopped, worker is preparing to remove container from under filling chute.

CONTAINER AND DIRECT LABOR COSTS

The cost of the flat-top basket with liner, top pad, and label was 54.5 cents compared with 56.9 cents for the crown-cover basket with liner, top pad, and label (table 2). The fiberboard boxes cost from 35.5 to 48.2 cents each. The costs of the containers are averages based on prices paid by peach shippers during the 1963 season and do not include discounts or bonuses.

Assuming an hourly wage of $1.25, the average cost of direct labor was about 7 cents for the baskets (table 2). The average labor cost to pack 38 pounds of peaches in the four types of boxes ranged from 3.5 to 3.6 cents per box.

The total direct labor and container cost was 63.8 cents for the crown-cover basket, 61.6 cents for the flat-top basket, 51.7 cents for the veneer-fiberboard box, and 39.1 cents for the cheapest fiberboard box. The difference between total cost of the crown-cover basket and the boxes ranged from 12.1 to 24.7 cents. Total savings for a trailer load of 600 containers would be $70 to $150, depending on the box used. If all eastern-grown peaches were shipped in these boxes, instead of in baskets, savings would amount to several million dollars annually.

TABLE 2.—*Cost of containers and direct labor to pack 38 pounds of peaches in crown-cover baskets, flat-top baskets, and 4 types of boxes, Georgia and South Carolina, 1963*

Type of container	Labor cost at $1.25 per hour [1]	Container and material cost [2]	Total cost per unit
	Cents	*Cents*	*Cents*
Baskets:			
Crown-cover	6.9	56.9	63.8
New flat-top	7.1	54.5	61.6
Boxes:			
Part-telescope veneer-fiberboard	3.5	48.2	51.7
Full-telescope fiberboard	3.6	39.3	42.9
Part-telescope H-divider	3.6	35.5	39.1
Part-telescope wing-lock	3.5	47.0	50.5

[1] Based on time studies of only direct labor to assemble, pack, and close containers, including an allowance of 15 percent for fatigue and personal time.

[2] Charges include containers, covers, liners, top pads, labels, and other accessory materials, depending on type of container.

BRUISING IN TRANSIT

The peaches were inspected upon arrival in the terminal markets to determine the amount and severity of bruising. Skin discoloration, stem punctures, cuts and skin breaks, and decay were negligible. The categories for classifying different degrees of bruising were based on the diameter of the bruising injury and the depth, color, and condition of the bruise, as follows:

Size of bruise	*Type of bruising*
Bruising injury less than ¾ inch in diameter and less than 3/16 inch in depth.	Slight.
Bruising injury between ¾ and 1 inch in diameter, or flesh discoloration over ½ inch in diameter or over 3/16 inch in depth.	Damage.
Bruising injury over 1 inch in diameter, or flesh discoloration over ¾ inch in diameter or over ¼ inch in depth.	Serious.

BASKETS

Bruising data for nine test shipments of peaches packed in the crown-cover and flat-top baskets from South Carolina and New Jersey are shown in table 3. All degrees of bruising were less for peaches shipped in the flat-top basket than for those shipped in the crown-cover basket. The differences were statistically significant in slight and damage degrees of bruising but not in serious bruising.

TABLE 3.—*Percentage of peaches bruised in conventional crown-cover baskets and in flat-top baskets on arrival at terminal markets, 9 shipments, South Carolina and New Jersey, 1962–63 season* [1]

Type of container	Degree of bruising [2]			Total bruising
	Slight	Damage	Serious	
	Percent	*Percent*	*Percent*	*Percent*
Crown-cover	5.8	1.7	1.6	9.1
Flat-top	4.0	.6	.9	5.5

[1] The percentage of skin discoloration and skin breaks and cuts was negligible.

[2] The difference in slight bruising between containers is statistically significant at the 5-percent level and in damage and total bruising at the 1-percent level. The difference in serious bruising is not statistically significant.

The percentage of peaches bruised to any degree, shown as total bruising, was much greater in the crown-cover basket, 9.1 percent, than in the flat-top basket, 5.5 percent. This difference also was statistically significant.

BOXES

Bruising data for peaches packed in boxes in six test shipments are shown in table 4. Slight

bruising ranged from 3.2 to 4.4 percent, damage bruising from 0.2 to 1.3 percent, and serious bruising from 0 to 0.4 percent. All four boxes protected the peaches from bruising to about the same extent.

TABLE 4.—*Percentage of peaches bruised in 4 types of boxes on arrival at terminal markets, 6 shipments, Georgia and South Carolina, 1963 season* [1]

Type of box	Degree of bruising [2]			Total bruising
	Slight	Damage	Serious	
	Percent	*Percent*	*Percent*	*Percent*
Veneer-fiberboard	3. 3	1. 3	0	4. 6
Full-telescope fiberboard	4. 4	1. 2	0. 3	5. 9
H-divider fiberboard	3. 4	. 2	. 1	3. 7
Part-telescope wing-lock	3. 2	1. 2	. 4	4. 8

[1] The percentage of skin discoloration and skin breaks and cuts was negligible.

[2] The difference in damage bruising between the H-divider fiberboard box and the veneer-fiberboard box is statistically significant at the 10-percent level; the difference in serious bruising between the part-telescope wing-lock box and the veneer-fiberboard box is statistically significant at the 5-percent level; other differences in degree of bruising between containers are not statistically significant.

RELATIONSHIP OF BRUISING TO SLACK AND OVERFULL PACKS

The new boxes were designed to carry between 38 and 39 pounds of peaches when jumble-packed regardless of size of the fruit. The boxes are usually filled about level full at the packinghouse, but the peaches settle in transit, leaving a space between the fruit and the cover. Some peach shippers overfill the boxes to make them appear full upon arrival in the terminal markets. Three test shipments were made with the boxes filled with about 40, 43, and 45 pounds of peaches.

The percentage of slight, damage, and serious bruising in the three test shipments varied with the net weight. Overpacking the boxes by 4.3 pounds (40.5 to 44.8 pounds) of peaches increased slight bruising from 1 to 10 percent, damage bruising from 1 to 4 percent, and serious bruising from 0 to 2.5 percent (table 5).

TABLE 5.—*Percentage of peaches bruised on arrival at terminal markets, 3 shipments, in the part-telescope divided fiberboard box, by weight, degree of slackness, and average net weight per 100 cubic inches* [1]

Boxes packed (No.)	Average net weight on arrival	Distance between fruit and cover	Average net weight per 100 cu. in.	Bruising [2]			
				Slight	Damage	Serious	Total
	Pounds	*Inches*	*Pounds*	*Percent*	*Percent*	*Percent*	*Percent*
12	40. 5	1–2	1. 96	1. 0	1. 0	0	2. 0
12	42. 9	½–1	2. 08	3. 0	2. 0	1. 5	6. 5
12	44. 8	0–½	2. 17	10. 0	4. 0	2. 5	16. 5

[1] This container had a capacity of approximately 2,063 cu. in.

[2] The differences in the sum of damage and serious bruising in the 3 packs are statistically significant at the 10-percent level. Other differences in bruising between packs are not statistically significant.

SUITABILITY OF CONTAINERS IN TERMINAL MARKETS

Peaches are usually unloaded in wholesale markets or at chainstore warehouses soon after arrival. In wholesale markets the containers usually are manually handled and are stacked several layers high for storage and display. In chainstore warehouses, the containers are stacked on pallets, and lift trucks move them to refrigerated warehouse rooms. The pallets generally are stacked two high in storage (fig. 9) to save floor space.

Peaches are loaded into trucks at chainstore warehouses and wholesale markets along with many other commodities for delivery to fruit jobbers, retail stores, fruit stands, and institutional users. Other containers of various types, sizes, and weights frequently are stacked on top of the peach containers during these deliveries.

The flat-top basket is sturdy and protects the peaches during these multiple handlings. It also forms a more stable stack than the crown-cover basket. Forty flat-top baskets can be stacked on a 40- by 48-inch pallet compared with 20 to 25 of the crown-cover baskets. Pallets loaded with flat-top baskets can be stacked two high.

The boxes can be stacked 4 and 5 layers high on the 40- by 48-inch pallet, for a total of 32 and 40 boxes, respectively. Pallets loaded with boxes also can be stacked two high (fig. 9). The rigidity and appearance of the various fiberboard boxes often deteriorated from absorption of moisture from the fruit or the air. The sides and ends of the boxes often bulged or creased, and when pallet loads of the boxes were stacked two high, the overhead weight often caused the walls of the boxes in the lower layers to bulge. The wooden ends of the veneer-fiberboard box gave the additional stacking strength needed for double stacking the loaded pallets. Weakening from absorption of moisture was not noticeable for this container.

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FIGURE 9.—Pallets of veneer-fiberboard boxes (left) and fiberboard boxes (right) stacked two high in the warehouse. To be stacked like this, containers need to be strong enough for those on the lower layers of the bottom pallet to withstand the pressure from above and protect the peaches.

SELECTION OF A PEACH-SHIPPING CONTAINER

Shipping containers for peaches should be inexpensive and efficient to pack; they should protect the peaches from bruising in transit and be acceptable to receivers and adaptable to the packinghouse equipment available to the packer.

Moistureproof containers should be used when the peaches are to be hydrocooled in the shipping container. These include (*a*) the crown-cover basket, (*b*) the flat-top basket, and (*c*) the part-telescope veneer-fiberboard box. Nonmoistureproof containers can be used when loose peaches are hydrocooled before packing. These containers are usually less expensive than those made of moistureproof materials.

Jumble-packed containers are less expensive to pack than faced baskets, protect the peaches from bruising fairly well, and can be used when acceptable to the receiver. When a receiver desires a container that is packed with faced fruit, either the crown-cover basket or the flat-top basket should be used.

The veneer-fiberboard box and the flat-top basket are particularly suitable where double stacking of pallets is essential.

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